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PRELIMINARY NOTE ON THE TERMINOLOGY APPLIED TO THE PARTS OF AN INSECT'S LEG*

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In the movements of locomotion, the hind legs of an insect are used largely for pushing the insect along (i.e., with a "kicking movement"); the hind coxae are therefore not so freely mobile, and in a dead insect, the hind legs usually project backward along the body. The forelegs are used largely for pulling the insect along; the fore coxae are slightly more mobile than the hind ones, and the forelegs are frequently directed forward in a dead insect. The middle legs, on the other hand, are used chiefly as supports in the tripod formed by the sets of legs in walking, and the middle coxae are usually freely mobile. The middle legs may project outward or even backward or forward in a dead insect.

The varying positions assumed by the legs in a dried specimen (in which the legs cannot readily be moved about without breaking them off) make it extremely difficult to apply a uniform terminology to homologous surfaces in all of the legs, since the outer or lateral surface of one leg may be turned inward or mesally in another, etc., and this difficulty led Grimshaw, 1905, (Entom. Mon. Mag., 2d. Ser. Vol. 16, p. 174) to propose the following method of designating the surfaces of any leg. If the leg be stretched out horizontally (or perpendicular to the body wall) so that the tarsus and tibia are as nearly as possible in a line with the femur, there are eight surfaces which Grimshaw designates as the dorsal, postero-dorsal, posterior, postero-ventral, ventral, antero-ventral, anterior, and antero-dorsal (counting clock-wise, as one looks at the lateral surface of the body). The ventral surface of the femur is applied to the ventral surface of the tibia when the leg is tightly closed upon itself, and certain entomologists apply the terms "flexor surface" to the surfaces thus opposed when the leg is closed, and they then call the opposite surfaces the extensor surfaces. The ventral surface of the tarsus is sometimes called the "plantar surface" by entomologists. There are a number of other terms which have been applied to the surfaces of the leg (Bolivar, Genera Insectorum, Fasc. 90; Schnabl, 1906, Wien. Ent. Zeitschr. Vol. 25, etc.); but Grimshaw's terms are the ones most generally used.

The *trochantin* (or *trochantinus*) is not considered as part of the leg in the following discussion, since it is clearly associated with the pleural region in lower insects, and only in the higher forms, such as the Coleoptera, etc., is it closely associated with the coxa. In many primitive insects the trochantin is divided by an oblique suture into an *antetrochantin* (*atn* of Fig. 6) and a *post-trochantin* (*ptn* of Fig. 6). The oblique *trochantinal suture* corresponds to an internal *endotrochantin*, or ridge for muscle attachment. The prothoracic

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trochantin is sometimes divided into a *basitrochantin* and a *distitrochantin* by a transverse cleft, but this division does not occur in many insects. Embedded in the basicoxal membrane near the base of the coxa are several small plates described by Crampton and Hasey, 1915 (Zool. Jahrb. Abt. Anat. Bd. 39, p. 6).

Coxa. The coxa of lower insects has two principal pivots, of which the chief pivot is the coxal process of the pleuron, formed by a downward projection of the pleural region at the base of the pleural suture. The tip of the trochantin forms a second pivotal point in many insects, but in the lower forms such as the roaches (Fig. 6) the tip of the trochantin may serve as a "pulling" point for moving the coxa by means of the muscles attached to the movable trochantin. In many holometabolous insects (Diptera, Trichoptera, Neuroptera, etc.) a third pivot of the coxa is furnished by a process of the sternal region which forms the coxal process of the sternum—a prolongation of the sternal region into the mesal surface of the coxa.

At the base of the coxa is a *coximarginal region* (*cm* of Fig. 6) and a ventral continuation of the pleural suture into the coxa forms the *meral suture, msu,* which divides the coxa into a *merocoxa* or *meron* (*me* of Fig. 6) and a *eucoxa, ec.* In the lower insects such as the termites, roaches, stoneflies, etc., the meron *me* is clearly a demarked posterior portion of the coxa (Fig. 6), and it is only in the higher insects that the meron becomes somewhat closely associated with the epimeron, so that it is quite incorrect to maintain (as some investigators have done) that the meron is a detached fold of the epimeron.

In certain roaches (Fig 6), Carabid Coleoptera, etc., the posterior coxae bear a *coxacrista, cxc,* or ridge, in the median portion of the coxae, while a furrow or *coxafossa, cxf,* lateral to the ridge, receives the femur, *fe,* when the latter is drawn up to the body. A process of the coxal ridge, called the *coxal process,* projects over the base of the trochanter of the hind legs in certain Coleoptera, roaches, etc. The sharp edge of the coxal ridge is called the *coxacarina.* The *coxatheca* is the cavity for receiving the head of the trochanter; and the *lateral* (anterior), and *median* (posterior) *trochantifers* are the processes of the coxa against which the condyles of the trochanter articulate.

Trochanter. The "head" of the trochanter (*trochocaput,* labelled *trc* in Fig. 9) is received in the coxatheca or articular cup at the apex of the coxa; and the *trochocondyles* (one of which is labelled *tcd* in Fig. 9) or condylar processes of the trochanter, one of which is anterior and the other posterior, articulate with the corresponding trochantifers or trochanter-bearing processes of the coxa, mentioned above. These form the pivotal points in the extensor and flexor movements of the trochanter, the extensor and flexor tendons of the trochanter being attached on either side of these pivotal points.

The trochanter articulates with the coxa, but does not articulate with the femur in any insect I have examined, and it is quite possible that the trochanter may be a constricted-off portion of the femur. At any rate, the so-called second segment of the trochanter in the Tenthredinoid Hymenoptera (labelled *bfe* in Fig. 7) appears to be a demarked portion of the femur. This demarked portion of the femur is not closely associated with the trochanter *tr,* and is only imperfectly marked off from the femur in many primitive Hymenoptera, so that it is preferable to designate it as the *basifemur* (*bfe* of Fig. 7) rather than by the terms which imply that it is a part of the trochanter (i. e., such terms as

distitrochanter, trochanterellus, etc.); and the term apophysis, sometimes applied to it, should be restricted to the internal processes of the sternal region.

Femur. The femur does not articulate with the trochanter in any insect thus far examined, and, as was mentioned above, this may indicate that the trochanter is a constricted-off portion of the femur. Distally, the femur articulates with the tibia, and the articulating surface of the femur to which the tibia is joined, is called the *gonytheca* (*gt* of Fig. 10) by entomologists. The gonythecal lobes, *gtl* of Fig. 6, prevent lateral movements of the tibia, and *tibiafers* (anterior and posterior) furnish the tibia-bearing processes with which the condyles of the tibia articulate. As was mentioned before, the dorsal surface of the femur is also called its extensor surface, and its ventral surface is also referred to as its flexor surface.

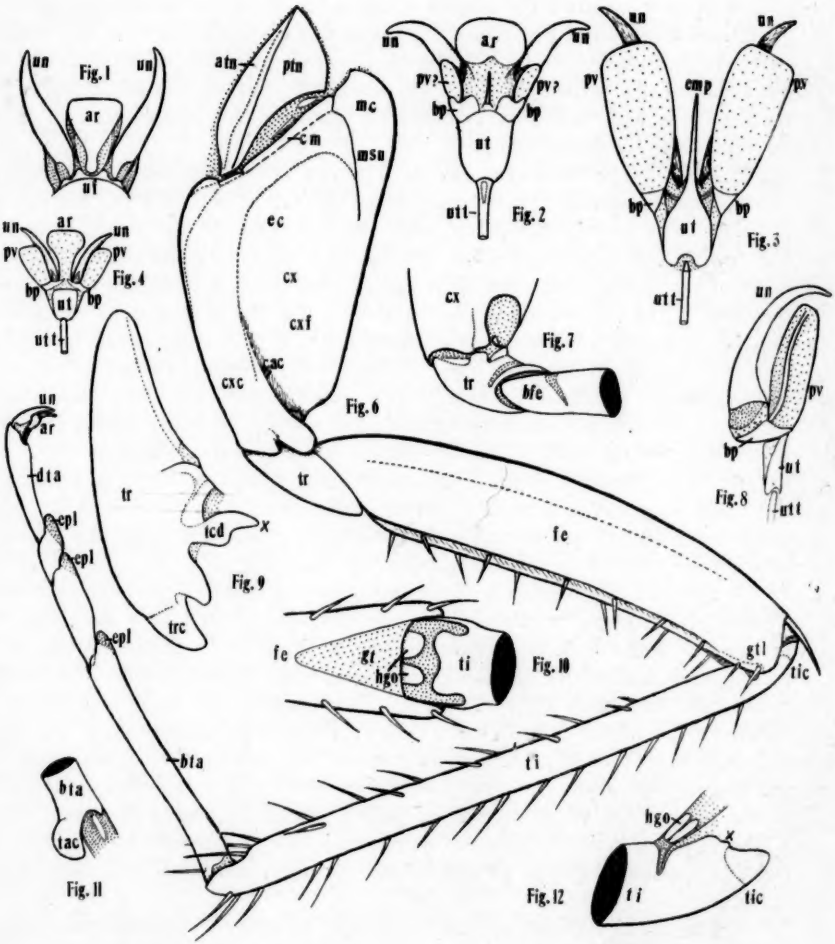
Tibia. The *tibiacaput* (*tic* of Figs. 12 and 6) or head of the tibia is received in the portion of the femur called the femur cup, and the *anterior* and *posterior tibiacondyles* articulate with the processes of the femur called the tibiafers. The *hypogonya* (*hgo* of Fig. 12) are chitinous plates below the angle of the "knee," and serve as points of attachment for the flexor tendons of the tibia. The cup at the apex of the tibia, for the reception of the head of the basal segment of the tarsus, is the *tibiatheca.* The dorsal surface of the tibia is sometimes called its extensor surface, and its ventral surface is sometimes referred to as its flexor surface. The longer apical spine-like structures at the tip of the tibia are sometimes called tibial spurs. In homologizing the spurs, spines, etc., on the tibia (i. e., the calcaria, etc.) of various insects, Comstock's differentiation between spines, spurs, setae, etc., should be borne in mind, since the origin of these structures is not the same in all cases; but it is frequently more convenient to use the same designation for all of the spine-like structures in a certain area of the tibia, regardless of their origin.

Tarsus. The segments of the tarsus may be referred to as the *tarsomeres.* The basal tarsomere is called the metatarsus when it is longer than the other tarsomeres, but the term metatarsus should refer to the entire tarsus of the metathoracic leg, so that the designation *basitarsus* is a preferable term to apply to the basal tarsomere (*bta* of Fig. 6). The head of the basal segment of the tarsus, or *tarsocaput* (*tac* of Fig. 11) is received in the tibiatheca, or cup of the tibia, and anterior and posterior *tarsocondyles,* or tarsal condyles, articulate with the corresponding anterior and posterior tarsofers, or tarsus-bearing processes of the tibia. The terms sarothrum, palma, planta, etc., have also been applied to the basal segment of the tarsus when it is modified for certain particular purposes in specialized groups of insects, but the term basitarsus is of more general application.

The distal segment of the tarsus may be termed the *distitarsus* (*dta* of Fig. 6), since the term onychium, which is sometimes applied to it (in certain Hymenoptera) is also used for the arolium, empodium, and other structures, and it is impossible to determine the original or most widespread use of the term onychium. The terms digitus, ungula, etc., are also loosely applied to the distitarsus by some investigators.

The claws are usually termed the *ungues.* The terms ungula, unguicula, onyches, etc., have also been applied to the claws, but the designation ungues is preferable to all of these. The claws are usually borne by the *unguifer* (*uf* of

CAN. ENT. VOL. LV. PLATE 3.



TERMINOLOGY OF AN INSECT'S LEG.

Fig. 1) or dorsal process at the tip of the terminal segment of the tarsus (distitarsus). A small retractile plate, the *unguitractor* or *tarsule* (tarsulus) labelled *ut* in Figs. 2, 3, 4, and 8, situated ventrally at the apex of the distal segment of the tarsus, may possibly represent a rudimentary tarsal segment, but this is not very probable. The plate in question is connected with the ventro-basal region of the claws by membrane and other structures, and serves to retract or flex the claws when it is pulled back by the *unguitractor tendon* (*utt* of Figs. 2, 3, etc.,) connected with its base.

Between the claws, and frequently articulating dorsally with the unguifer (*uf* of Fig. 1) is a pad-like structure *ar*, which the students of the lower groups of insects term the *arolium*. It is sometimes incorrectly referred to as the pulvillus, empodium, etc., but these terms should be restricted to other structures which are not strictly homologous with the arolium. The so-called pulvilliform empodium of certain Diptera, such as the one shown in Fig. 4, *ar*, is probably an arolium, since it occupies the typical aroliar position between the claws, and articulates dorsally with the unguifer, as does the arolium of lower insects (Fig. 1). I would therefore designate this structure as an arolium, rather than an "empodium" in these Diptera. The true *empodium* is a process of the plate labelled *ut* in Fig. 3, where the empodium bears the label *emp*. A great many heterogeneous structures pass under the name "empodium," but the true empodium is a process of the unguitractor plate *ut*, and does not articulate dorsally with the unguifer, as the arolium does (Fig. 1) in many lower insects. The unguitractor frequently bears apical setae which may be called the parempodia, or unguitractor setae. These are usually two in number. A pseudempodium, or median bristle-like structure resembling the empodium may occur between the bases of the claws, and this has been mistaken for the true empodium in some cases.

The *pulvilli*, *pv* of Figs. 3, 4 and 8, are pad-like structures on either side of the unguitractor plate, and they are usually closely associated with the ventro-basal region of the claws. In many insects a *basipulvillus* or basal plate occurs in the proximal region of each pulvillus (*bp* of Figs. 3, 4, 2, etc.) and, as shown in Fig. 8, this basal pulvillar plate, *bp*, may extend laterally around the base of the claw. I do not know how the pulvilli arose, but two possibilities suggest themselves as to their origin. The condition met with in certain Hymenoptera in which the arolium is partially divided by a deep dorsal furrow, suggests that the pulvilli may be portions of a divided arolium; and in certain Hemiptera-Homoptera there are conditions suggestive of a demarcation of the arolium into lateral regions, while the nature of the pulvilli in such Diptera as the one shown in Fig. 4 gives some further indication that they may be detached portions of the arolium *ar*. On the other hand, the pulvilli may be developed from the somewhat membranous areas at the base of the claws, such as those labelled *"pv?"* in Fig 2, and the relation of these membranous areas to the basipulvilli *bp* in Fig. 2 is certainly suggestive of the relation of the true pulvilli *pv* to the basipulvilli *bp* in Fig. 3. This further suggests that the pulvilli may be detached portions of the claws, and the nature of the claws in certain Ephemerids (in which the claws are quite pad-like) would lend weight to the view that the pulvilli are detached portions of the claws, which become deeply cleft in many insects, thus

suggesting the beginning of a process that might end in formation of the pulvilli.

The designation, pulvilli, is frequently applied to the small pad-like structures (*epl* of Fig. 6) on the under side of the tarsal segments, but the term pulvilli should be restricted to the structures labelled *pv* in Figs. 3 and 4, which are not homologous with the pads under the tarsal segments. The designations plantulae or soleae would be very appropriate for the pads labelled *epl* in Fig. 6, but unfortunately these terms have been applied to other structures. To avoid confusion, I have referred to the structures *epl* of Fig. 6 as the *euplantulae*, thus preserving the term plantulae, which is extremely appropriate for the structures in question—and might even be used in this sense if it were clearly understood that no other structures were indicated by the term. The three euplantulae on the basal segment of the tarsi of grasshoppers, etc., may indicate that the basal segment (basitarsus) is in reality compound in these insects, being made up of three tarsomeres united. The abnormal tarsus of the roach shown in Fig. 6, however, exhibits only three euplantulae, despite the fact that the second tarsomere appears to be formed by the union of the second and third tarsomeres occurring in normal roaches of the same species.

It is rather peculiar that so many holometabolous insects have pentamerous tarsi, while so many lower insects have tarsi composed of fewer than five segments. This led me to suggest in a former paper, that the lower number might be the primitive one, but the question is by no means settled, since it would appear that five segments may be nearer the original number, and the reduced number may be due to fusion or loss of segments.

The designation, propedes, has been applied to the uropods or pleopods occurring on the abdomen of larval insects, but it is preferable to designate the larval abdominal legs as *uropods* or *pleopods* (the posterior ones being termed the *postpedes*), and to use the term *propedes* (or *propods*) for the prothoracic legs, as the term indicates. The mesothoracic legs would then be designated as the *mesopedes* (or *mesopods*), and the metathoracic legs would be termed the *metapedes* (or *metapods*). This usage is in conformity with the rule restricting the application of the prefixes pro-, meso-, and meta-, to structures of the prothorax, mesothorax, and metathorax respectively.

ABBREVIATIONS

ar...Pad between tarsal claws (*arolium*).
atn...Anterior division of trochantin (*antetrochantin*).
bfe..Basal region of femur (*basifemur*).
bp...Plate at base of pulvillus (*basipulvillus*).
bta..Basal tarsomere (*basitarsus*).
cac..Coxal carina (*coxacarina*).
cm.Marginal region of coxa (*coxamargin*).
cx..*Coxa.*
cxc..Coxal ridge (*coxacrista*).
cxf..Coxal fossa (*coxafossa*).
dta..Distal segment of tarsus (*distitarsus*).
ec....Anterior region of coxa (*eucoxa*).
emp..*Empodium.*
epl...Plantula, s. str. (*euplantula*).
fe...*Femur.*
gt...*Gonytheca.*
gtl..*Gonythecal lobes.*
hgo.Plates beneath angle of "knee" (*hypogonia*).
mc..*Merocoxa* or *meron.*
msu..*Meral suture.*
ptn..Posterior division of trochantin

(*postrochantin*).
pv...*Pulvilli.*
ta...*Tarsus.*
tac..Head of tarsus (*tarsocaput*).
tcd..Condylar process of trochanter (*trochocondyle*).
ti...*Tibia.*
tic..Head of tibia (*tibiacaput*).
tr...*Trochanter.*
trc..Head of trochanter (*trochocaput*).
uf..Structure bearing ungues (*unguifer*).
un...Tarsal claws (*ungues*).
ut...Plate for retracting or flexing claws (*unguitractor* or *tarsulus*).
utt..*Unguitractor tendon,* or tendon for retracting or flexing claws.
x....Pivotal point.

EXPLANATION OF PLATE

Fig. 1. Dorsal view of tip of tarsus of the roach *Periplaneta americana.*
2. Ventral view of same.
3. Ventral view of tip of tarsus of the Dipteran (Asilid) *Proctacanthus heros.*
4. Same of Leptid Dipteran *Chrysopilus thoracicus.*
6. Hind leg of roach *Periplaneta americana* (abnormal specimen), lateral view.
7. Trochanteral region of leg of Tenthredinid Hymenopteran, lateral view.
8. Lateral view of claw and pulvillus of *Proctacanthus.*
9. Mesal view of hind trochanter of *Periplaneta.*
10. Ventral view of apex of femur of *Periplaneta.*
11. Lateral view of head of basal tarsomere of same.
12. Lateral view of head of tibia of same.

STUDIES IN CANADIAN DIPTERA.

I. Revision Of The Asilid Genus Cyrtopogon And Allied Genera.

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(Continued from page 125)

Cyrtopogon dasyllis Williston

Large; 16 to 18 mm.; hair of head and thorax wholly black; second, third and fourth abdominal segments with thick, even, yellowish pile.

Length 16 to 18 mm. *Male.* Face moderately gibbose, more prominent above; thickly yellow or greyish yellow pollinose; pile of head wholly black. Front subshining in the middle, with similarly colored pollen to that on face. Occiput grey pollinose. Antennae black, third joint reddish, its base diffusely brownish. First antennal joint about twice as long as wide; second slightly longer than wide; third joint one and one-half times as long as the first two combined; widest about its middle. Style short, stout, obtuse, shorter than the second joint.

Thorax shining black, thinly reddish brown pollinose, with some irregular patches of more yellow pollen. Scutellum shining black, convex. Pile of thorax wholly black; the hairs of the scutellum and epipleura tipped with pale.

Legs black; tibiae with the posterior surface piceous reddish; tarsi all reddish. Hairs of legs moderately abundant, black. Pile on front tarsi white, shining. Pubescence on front and apex of hind tibiae brassy yellow.

Wings pure hyaline, with a large, apical brown spot; last section of sixth vein bordered with brown.

Abdomen shining black; the first four segments with even, dense, yellowish pile, the first segment with a few black hairs anteriorly. Apical segments and genitalia with slightly shorter black pile.

Female. Mystax yellow in the middle; beard largely yellow; "5" on mesonotum rather distinct, yellow pollinose.

Wings beyond the middle decidedly fuscous, paler posteriorly and along the margin apically.

Four specimens of both sexes from Kaslo, B. C., September, (J. Cockle). One specimen has been compared with the type.

Cyrtopogon curtistylus new species

Large, allied to *dasylloides* but the coxae black haired; head black haired; front legs with some silvery white pile.

Length, 16 to 18 mm. *Male.* Face strongly gibbose, more prominent above; the mystax bright yellow, laterally narrowly bordered by stouter black hairs, below widely bordered; thinly pale greyish pollinose. Front shining black; occiput thinly greyish; hairs of head and beard wholly black. Antennae black; first joint twice as long as wide; second two-thirds as long as first; third one and one-half times as long as the first two combined, wider than the first joint, scarcely narrowed basally, with almost parallel sides; style very short, obtuse.

Thorax shining black; wholly black haired; with conspicuous marginal bristles. Scutellum shining black, with coarse, black pile of even length.

Legs shining black; simple; wholly black pilose except on front legs; pile rather abundant; longer on front tibiae; on the front tibiae behind on the apical fifth and the upper surface of their tarsi with silvery white pile, that on the tarsi short, subappressed, not extending onto the last joint.

Wings hyaline on basal half; on the outer half yellowish brown, darker in the middle and front; largely fading out apically and posteriorly.

Abdomen shining black, apparently without grey pollinose markings; first segment with short, reddish yellow pile; second, third and fourth with even, erect, long orange colored pile; apical segments with less erect shorter black pile.

Holotype, ♂, Cache Junction, Utah, June 3, 1912, (H. R. Hagan), in C. W. Johnson Collection.

Paratype, ♂, same data, No. 578, in the Canadian National Collection.

Readily distinguished from *dasyllis* by the clouded wings.

Cyrtopogon albitarsis Curran

Abdomen with reddish yellow pile forming dense apical segmental bands; third antennal segment red; anterior tibiae and tarsi with a posterior fringe of short, silvery hair.

Length 11 to 12 mm. *Male.* Face moderately gibbose, convex receding, the pile golden yellow, below, and up the sides to the middle, stouter, black; ground colour obscured by pale yellowish pollen. Front yellow pollinose; wholly black pilose. First two antennal joints black, with black hairs; third joint reddish yellow, constricted slightly just beyond the base; longer than the two basal segments combined, broadest about its middle; style usually black,

but the base may be yellow. Occiput greyish yellow pollinose, black pilose; beard white, well separated from the eyes.

Thorax with a very conspicuous greyish yellow pollinose 5 on either side, the enclosed portion deep shining black, the margin behind the suture and a triangular projection inside the postalar callus, also shining, elsewhere with greyish yellow or yellow pollen, the median line narrowly greyish in front on either side of which is a broader grey stripe; or the anterior curve of the five and the median geminate stripes may be ashy. Pleura yellowish grey pollinose. Pile black; on the propleura white, or the epipleura mixed black and golden. Scutellum convex with a golden brownish pubescence in some lights; pile black.

Femora all black, the apices narrowly yellow; pile black above, not very abundant, pale yellow below and behind. Tibiae reddish, the anterior ones paler, immediate base and apices black or blackish, anterior ones with moderately long silvery white pile posteriorly, short yellow pile anteriorly; a few black bristles exteriorly, several slender ones below anteriorly near the base and three below posteriorly, some of which may be reddish. Middle tibiae with silvery white pile in front and exteriorly, yellow pile elsewhere; with numerous black bristles. Hind tibiae wholly black pilose, the end below golden pubescent. Anterior tarsi yellow, with silvery pile which forms a dense fringe posteriorly; on the basal two segments the pile is bright yellow anteriorly. Pile all white on middle tarsi, which are darker than the anterior ones but paler than their tibiae. Hind tarsi with black hairs, in colour, similar to the middle tibiae.

Wings sometimes slightly tinged with luteous apically. Squamae fuscous with whitish border and fringe.

Abdomen black; second, third and fourth segments each with a posterior silvery greyish pollinose band, which appears yellow beneath the pile. First four segments reddish or tawny pilose, sparser and shorter anteriorly so that the pile appears in broad bands. Fifth, sixth and seventh segments triangular when viewed from behind, black pilose; with a narrow transverse band of short, black pile about their middle dorsally, the last one or two segments with a steel blue reflection on the "keel." Hypopygium black; with a conspicuous fringe of black hairs sub-basally.

The ♀ differs so markedly from the ♂ that I describe it in detail, and designate it as the Allotype.

Female. Facial gibbosity a little more even than in ♂. Mystax rather thin, black, in the middle with finer, but not condensed, white hairs. Front moderately yellowish white pollinose, black pilose. Occiput grey pollinose, black pilose, fine white pilose on lower half except along the orbits. First two antennal joints piceous, whitish pollinose, black haired; third black, rather slender, conspicuously concave on basal half. Style slender, slightly longer than in ♂.

Thorax shining black, pleura greyish white pollinose. Middle line of mesonotum rather broad, brownish in some lights, black in others, thinly pollinose, in front with a short, median, narrow, whitish pollinose stripe; in some lights with three narrow shining stripes, the opaque stripes slender. The grey

pollen leaves a small oval spot inside and behind the humeri, a large roundish one before the suture, a less roundish one behind the suture, dark, thinly pollinose in some lights, the posterior of the thorax similar. Hairs of mesonotum black, but intermixed with white before the scutellum. Pleura white haired, the mesopleura wholly and a few of the trichostical hairs black.

Femora piceous, their narrow apices and remainder of legs dirty yellowish, the front tibiae a little darker. Femora white pilose above, dorso-anteriorly and apically, with black pile. Tibiae black pilose, the hind ones on the outer side with shorter white hair, on the inside with longer black hair. All the tarsi black haired.

Wings clear hyaline, the veins not clouded.

Abdomen shining black, the second to fifth segments with greyish white pollinose apical fasciae, the last one broadly interrupted, all widest laterally, narrow in middle. Pile on disc, except basally, short, black; on sides longer, white.

Allotype—♀, Banff, Alta., July 9, 1916, (C. G. Hewitt), No. 501, in the Canadian National Collection, Ottawa.

The type ♂, Banff, July 17, 1916, (C. G. Hewitt); and paratype ♂, Banff, July 23, 1909, (N. B. Sanson) are before me.

I did not associate the ♀ with the two males at the time the species was described, owing to the great differences between the two, but there can be no doubt that they are the same species and the ♀ was taken only eight days before the type ♂. Sexual dimorphism is quite common in the genus, but is not so well marked in other groups, although a good example occurs in *C. bimacula*, the ♀ of which lacks the alar spots.

Cyrtopogon aurifex O. S.

Allied to *albitarsis* but the last two tarsal joints are black; the legs are more reddish, mystax paler, pollinose abdominal bands wider, etc.

Length 12 to 13 mm. *Male*. Face gibbose, most prominent on the upper half, densely pale yellow pollinose; mystax whitish, with a margin of stouter black hairs, which are abundant at the oral margin. Front rather golden pollinose, shining just at the antennae and about the ocellar triangle. Occiput shining black; yellow pollinose like the front above, pale yellow pollinose below. Pile of front and occiput black, on the lower half of the latter, except against the eyes, white, but not dense. Antennae black, third joint red; first joint twice as long as wide, second two-thirds as long as first, a little longer than wide; third one-third longer than the first two combined; style as long as the width of the second joint of antennae, slender, tapering, not acute. Antennal hair black. Palpi black, black haired.

Thorax shining black, the pleura bright yellow pollinose, almost tawny in some lights. Mesonotum with a narrow, entire median vitta on either side of which is a narrow, dark brown vitta, outside of which is a broader tawny yellow vitta, the latter and the median one united just before the scutellum, but the lateral ones do not reach the apex of the thorax. The 5 is well formed, rather golden colored, but the dash is disconnected and oblique and the curve is sub-interrupted before and behind; on either side on the sub-posterior third of the mesonotum is a broad, golden yellowish stripe running over the posterior

end of the 5, best seen from behind. Pile of thorax black; bristles black; only the propleura with fine white pile. Scutellum convex, yellowish pollinose on disc basally, with rather stout black hairs.

Femora black, just their extreme apices yellow. Tibiae yellowish red, their apices broadly black; tarsi of same color, their last two joints black. Coxae whitish pilose. Femora moderately black haired, with pallidly yellow hair below. Tibiae black haired, only the posterior apex of the front ones with some silvery white hairs. Tarsi black haired, the first three joints of the front ones with silvery white pile, which is more abundant behind and in front. Pubescence on front and hind tibiae and tarsal pads brassy yellowish.

Wings hyaline, the stigma, and all the furcations and crossveins clouded with brownish or brownish yellow. Squamae white, with bright yellow border and short white fringe. Halteres yellow, the stem fuscous.

Abdomen rather dull black, with the second to fourth segments densely tawny or reddish pilose, the bases and narrow apices of the segments bare, so that the abdomen appears markedly banded; middle of the segments anteriorly but thinly pilose; first segment short yellow pilose, not pollinose, with a tuft of brownish pile on anterior angles; second segment with black pile on anterior angles; second to fourth segments yellow pollinose on posterior half. Fifth, sixth and seventh segments greenish blue in the middle, shining black on sides, the middle compressed and roundedly carinate; pile on eighth segment wholly, and the preceding three except the carina, very dense, short, black, obscuring the ground color; the fifth to seventh segments each have a narrow sub-basal, transverse, very dense, short, pilose band and a second one just beyond the middle, but the basal one may be quite at the base of the segment in some cases. Genitalia shining black, with moderately sparse pile.

One ♂, Vancouver Island, B. C., June 4, 1888, (G. W. Taylor). This specimen was compared with the type and showed no difference whatever. The pile on the sides of the terminal segments is much more dense than in *albitarsus* and the segments are much less strongly carinate. I have not a ♀ before me, but it may be distinguished from ♀ *albitarsus* by the color of the legs. For doubtful ♀ with entire bands compare with that species and this.

Cyrtopogon bimacula Walker

Wings of ♂ with large apical cloud and smaller cloud covering apex of anal cell; wing of ♀ a little greyish beyond end of first vein and about apex of discal cell; tibiae and tarsi yellow or reddish, both with blackish apices.

Length 8.5 to 15 mm. *Male.* Face moderately gibbose, whitish pollinose; mystax white, margined with black hairs which are more abundant along the oral margin, not dense. Front yellow pollinose, with a median shining black stripe which expands above the antennae and surrounds the ocellar tubercle. Pile black, long, rather fine. Occiput shining black, white pollinose below, yellow pollinose along the orbits above. Pile black, on the lower half white, just a few black hairs along the orbits below. Antennae black, thinly greyish pollinose; black haired. First joint hardly twice as long as wide, the second not quite as long as first; third almost one third longer than first two combined, rather narrow basally, broadest at apical fourth; style short, not longer than least width of second joint, rather stout, with sharp spine at apex.

Thorax shining black, pleura above, yellowish pollinose; shining on more than lower half. Mesonotum yellowish pollinose; with a darker stripe on either side of the median stripe of about the same width as the stripe but abbreviated behind. A stripe running from inside the humeri obliquely to the side margin, and the side margin wholly, but narrowly so between the suture and wings, shining black; a broad, darker area on either side commencing before the suture, sub-interrupted on the suture and not quite reaching the shining posterior margin; posterior margin whitish pollinose in middle. Pile and bristles black; only the propleura white pilose. Scutellum shining black, disc yellowish pollinose basally; hair rather fine, long, black.

Femora black; tibiae reddish, their apices broadly black, the front ones more broadly so exteriorly; tarsi reddish, the last joint black, the two preceding somewhat blackish above. Femora black haired, yellowish white haired below, postero-ventrally and at immediate bases; tibiae and tarsi with black hair and bristles, the pubescence brassy yellow.

Wings hyaline; a large cloud apically commencing at the apex of the first vein, and extending back to just basad of crossvein, thence extending obliquely to behind the intercallary vein, and a spot in the apical third of the anal cell, spreading somewhat outside it, brownish, the immediate border of the wing beyond the apex of the second vein hyaline. Squamae white with yellow border and short white fringe. Halteres yellow, the stem fuscous.

Abdomen shining bluish black, metallescent, the second to fifth segments with an elongate, subtriangular greyish white pollinose spot on the posterior angles. Pile yellow, on the sides longer, white, on the sericeous spots subappressed and rather conspicuous. Genitalia with rather sparse, short, black and reddish hairs.

Female. Usually much larger but most specimens average about 12 mm. Mystax usually yellow, at least whitish yellow, the black hair not more abundant.

Median line of thorax slender, tapering, yellow, but wholly separating the dark vittae, and narrowly bordered on the front half by black.

Legs similar in color, but the pale parts a little darker. Front femora almost all black haired, the hind ones almost all pale pilose, the hind tibiae black haired except on the inside.

Wings lacking definite spots, but slightly darkened (greyish or cinereous) in the same regions as in the ♂.

Abdominal pollinose spots longer, separated by about the length of one spot, but small on the fifth segment.

Described from ♂, Douglas, Man., June 10, 1921, (N. Criddle), and ♀, Nordegg, Alta., July 7, 1921, (J. McDunnough).

This species shows remarkable variation in size and the two specimens before me represent the extremes, the ♀ being slightly larger than any others which I have seen, while the ♂ is as small as any. It occurs across Canada east of the Rockies, and extends down to Pennsylvania in the east and down the western slopes of the Rockies into Colorado.

Two females from Sudbury, Ont., and one ♀ from Truro, N. S., have the clouds on the wings more brownish yellow and more evident on the crossveins.

Cyrtopogon nugator O. S.

Scutellum flat, grey pollinose; abdomen with narrowly interrupted or entire segmental bands; antennae wholly black.

Length 10 to 12 mm. *Male*. Face rather strongly gibbose, the greatest prominence above the middle; mystax moderately abundant, stout, black; greyish white pollinose. Front thinly grey pollinose, more thickly so laterally; black haired. Occiput silvery white pollinose, white pilose, a few black hairs along the orbits. Antennae black; thinly greyish pollinose; first joint twice as long as wide, second practically as wide as long; third over one and one half as long as first two combined, broader than first joint, widest at apical fourth; style one fourth as long as third joint, rather stout.

Thorax grey pollinose; a broad median stripe, abbreviated behind, narrowly interrupted on front part, on either side a broader stripe, commencing half way between the front margin and suture and sub-interrupted at the suture, brownish pollinose. Mesonotum sparsely black haired, with rather fine black bristles; humeri, prothorax and pleura, fine white haired; the meso-pleura with a few black hairs. Scutellum flat on disc, grey pollinose; its margin shining; pile white, fine, on disc; stout, black on whole margin.

Legs shining black, simple; femora white pilose, a few black hairs apically; tibiae white pilose, the front ones black pilose externally; bristles black. Front and hind tibiae yellow pubescent. A row of short, black bristles on posterior surface of hind tibiae.

Wings limpid hyaline. Squamae white, with yellow border and fine white fringe. Halteres yellow, the stems fuscous basally.

Abdomen shining blue-black; the first to fifth segments each with the posterior margin broadly-grey pollinose, the bands moderately interrupted, although the second, third and fourth band are normally entire. Sixth segment with a small, triangular pollinose spot on posterior angles. Pile wholly white, longer on sides, especially basally.

Female. Quite similar, the pile a little shorter, the abdomen slightly broader.

♂, Saanich District, B. C., June 7, 1919, (W. Downes); ♀, Vernon, B.C., June 8, 1920, (N. L. Cutler); ♀, Agassiz, B. C., April, 1919, (A. B. Baird).

Cyrtopogon sansoni new species

Allied to *nugator* O. S., but the tibiae in the female are wholly black haired, the pollinose bands are decidedly interrupted, the scutellum is wholly black haired and the thorax much paler pollinose.

Length, 9 to 10 mm. *Male*. Face moderately gibbose, almost evenly convex, shining black, thinly covered with brown pollen, with small, transverse yellow pollinose band below the antennae; mystax wholly black, rather dense, not coarse. Front wholly thinly grey pollinose with rather abundant, crinkly black hair. Occiput whitish pollinose, less thickly so above, with a few fine black hairs above, and many on the lower third against the eyes, the latter crinkly. Antennae black, thinly grey pollinose, the apices of the first two segments without pollen; first segment scarcely twice as long as wide, second two-thirds as long as the first, practically as broad as long, both black haired; third joint nearly twice as long as first two, rather slender on basal third, not stout;

style not as long as width of second joint, tapering, not slender.

Thorax greyish white pollinose, with a pair of pale brown stripes on either side of the middle line, well separated from the front and posterior margin; with an obtuse, sub-roundish spot before the suture and a rather narrow stripe behind, moderately separated from the median geminate brown stripe, brown pollinose, the mesonotum more shining behind this stripe. There is also a small, brownish spot just behind the outer end of the suture. The pleura are evenly pollinose, only the narrow suture between the meso- and sternopleura shining. Pile of mesonotum, fine, moderately abundant, crinkly, not long, but longer behind and the fine bristles black. Mesopleura with similar pile. Sternopleura above, propleura and trichostical pile white, Scutellum plane, grey pollinose, its margin shining black. Wholly black pilose, without distinct bristles, the hairs moderately stout, crinkly.

Legs shining black, simple; femora with fine white pile, the front four on apical half, except behind, with more abundant black pile, hind ones with only a few black hairs apically. Tibiae black haired, the middle ones with short, sparse white hairs behind, the hind ones wholly white haired; tarsi wholly black haired. Spines all black; pubescence on front and hind tibiae and tarsal pads, bright yellow.

Wings hyaline, the third vein branching well beyond the discal cross-vein.

Abdomen shining blue black, the second to sixth segments with a posterior grey pollinose band, broadly interrupted in the middle, all the bands slightly wider laterally, the anterior one less widely interrupted, the apical ones slightly increasingly more broadly so; the seventh and eighth segments in well preserved specimens greyish yellow pollinose with the apex shining black; first segment grey pollinose on lateral fifth. Pile short, black on disc, longer, fine, whitish on sides. Genitalia white pilose, a few black hairs below.

Female. Face evenly whitish grey pollinose, with a transverse brownish spot above the oral margin, the mystax less dense.

Thorax still paler pollinose, the darker areas brownish yellow.

Femora with slightly more pale pile, the tibiae wholly black pilose. Sixth and seventh abdominal segments wholly shining.

Holotype, ♂, Banff, Alta., July 5, 1915, (N. B. Sanson); No. 583, in the Canadian National Collection, Ottawa.

Allotype, ♀, Banff, Alta., July 9; 1916, (C. G. Hewitt).

Cyrtopogon lutatius Walker

Scutellum plane, grey pollinose, the lateral margins broadly shining.

Length 9 to 11 mm. *Male.* Face rather strongly gibbose, yellowish white pollinose; mystax wholly white, fine, dense. Front yellow pollinose, a small black spot just above the antennae, the narrow anterior margin of the ocellar tubercle also dark; pile sparse, fine, white. Occiput white pollinose, becoming brownish yellow above, almost all white pilose; many black hairs above and a few yellow ones along the eyes below. Antennae black, thinly yellowish pollinose, with fine white hair and one black bristle on lower apex of second joint; first joint twice as long as wide, slender, second more robust, and equal in length; third joint one and one third as long as the first two combined, thickest at the

middle, of medium width; style equal in length to the first joint, moderately stout, slightly tapering, with short, apical bristle.

Mesonotum greyish or brownish yellow pollinose, a broad stripe contiguous to the middle line, on either side, more brownish; inner side of humeri, and a broad stripe on the apical two thirds, not quite reaching the hind margin and interrupted at the suture, blackish. Very narrow lateral margin and the upper surface of the postalar calli shining black. Posterior margin grey pollinose. Pleura greyish or yellowish pollinose, the meso- and sternopleura with more brownish yellow pollen, the former with an oblique, broad oval shining spot on lower and posterior margin. Pile of mesonotum short, black, only a narrow band on anterior and posterior margins pale haired. Meso- and sternopleura white haired; trichostical pile black, often a few white hairs. Scutellum shining black on the sides, the middle broadly, expanded at the base and extending along the apex, grey pollinose; with sparse white pile and fine apical bristles.

Legs wholly black, rather sparsely short white pilose, the bristles white or yellowish; tarsi black haired, coxae grey pollinose, white haired. Legs wholly simple.

Wings hyaline, slightly greyish on apical half; the third longitudinal vein (R_{4+5}) branches a considerable distance beyond the discal crossvein. Squamae whitish with fine white fringe. Halteres yellowish, the stem a little fuscous basally.

Abdomen shining blue black, the second to sixth segments with a greyish posterior crossband on about the lateral third; the crossbands are of equal width and length, so that the anterior ones are more broadly separated, the posterior ones gradually less widely separated, only the median ones actually separated by one third the width of the segment; the first segment is grey pollinose laterally, the spot rather quadrate; seventh and eighth segments grey pollinose except the posterior margin, the black slightly convex anteriorly. Abdominal hairs sparse, short, black and yellow, alternately appearing chiefly of either color from different views. Genitalia yellow haired.

Female. Gibbosity shining on upper half; mystax thin, margined by a row of black hairs, the black hairs abundant below. Front with the lower third and sometimes a projection upward on either side, shining. Hairs all black, or a few white ones on front of ocellar tubercle. Occiput without the stouter yellow hairs below. First two antennal joints sometimes piceous, the apex of the second reddish, this joint with two long bristles below, one in the middle, the other apical.

Pollen on thorax more greyish, the broad, interrupted stripe brownish pollinose.

Middle and front tibiae sometimes piceous or yellow brown except the apical fourth.

Abdomen broader than the thorax, widest at the middle, the pollinose cross-bands longer, the first three interrupted by about one-fifth the width of the segment, the fifth narrowly so or entire, the seventh segment with an entire sub-apical fascia, the eighth bare when visible.

Five specimens: ♂, Jordan, Ont., June 1, 1919; ♀, Jordan, June 6,

1920, (C. H. Curran); ♀, Bathurst, N. B., July 26, (J. N. Knull); ♂, Drumgold, Pa., June 11, 1919, (A. B. Champlain); ♀, Carlisle Junction, Pa., June 27, 1910

Cyrtopogon varans new species

Third antennal joint red on apical two-thirds; mystax black and yellow, tibiae reddish with black apices.

Length 15 mm. *Female.* Face strongly gibbose, the swelling reaching to the base of the antennae; without a ridge; mystax composed of coarse black hairs, the middle hairs less coarse and whitish yellow; greyish white pollinose. Front shining black, only pollinose along the eyes and above; vertex black. Occiput grey pollinose; black pilose, below, except along the orbits, yellowish white pilose. Antennae black; third joint yellow on apical two-thirds or more; first two joints grey pollinose, black haired. First joint three times as long as wide; second a little longer than wide; third one-fifth longer than first two combined; rather broad, style tapering, acute; one-fifth length of third joint.

Mesonotum with the sides and a spot before the scutellum shining black; densely brown pollinose; a narrow median stripe on anterior half, a stripe along the inner side of the humeri, a narrow 5, with only the curved part and a large apical spot, yellow pollinose. Pile wholly black; three long black bristles, one just before the suture; two before the postalar calli, black. Pleura yellow pollinose; black pilose; propleura white pilose. Scutellum shining black, with a yellowish grey sheen basally, convex, black pilose, the apical hairs very long and a little stouter.

Femora shining black; tibiae piceous reddish, their apices broadly black; tarsi black, the bases of the joints reddish. Pile and bristles of legs black; some pale pile beneath all the femora.

Wings hyaline; a little greyish apically; all the crossveins and furcations broadly brownish.

Abdomen shining black, the second to fifth segments each with an elongate triangular, transverse, greyish pollinose spot on either side apically, the spots not over one-fifth the distance across the segment. Pile yellow; whitish basally on the sides.

Holotype, ♀, Gaspe, Quebec, Sept., 4, 1914, (C. H. Young), No. 576, in the Canadian National Collection, Ottawa.

Cyrtopogon marginalis Loew.

Grey pollinose crossbands of abdomen narrowly interrupted, obscurely interrupted in ♀; third antennal joint red; legs almost wholly white haired, with black bristles; scutellum convex; pleura wholly pale pilose.

Length, 11 to 15 mm. *Male.* Face moderately gibbose, most prominent above, pale yellowish pollinose, the sides with more whitish pollen; mystax composed of moderately stout black hairs, above with chiefly whitish, slightly finer hair. Front thinly greyish yellow pollinose, with black, moderately long hairs, all the hairs on the ocellar tubercle white. Occiput silvery pollinose, more yellowish above; along the orbits black haired; elsewhere, including the vertex, with white pile. First antennal joint black, its apex narrowly red; twice as long as wide; second joint reddish with a broad black sub-basal band, slightly

wider than long, two-thirds as long as first joint; third joint reddish yellow; practically twice as long as the first two combined, narrower than the first joint, the sub-basal half concave below; style black, moderately narrow, slightly tapering, as long as first joint, its spine small but conspicuous.

Mesonotum brownish yellow, three median stripes brown, with a blackish stripe separating them; on either side of the outer blackish stripe on the posterior two-thirds is a broad, slightly tapering, more shining stripe, interrupted at the suture and not reaching the posterior margin. The lateral and posterior margins wholly, broadly shining black, including the humeri and postalar calli, but narrowly interrupted at the suture. Pleura yellowish white pollinose, a rectangular shining spot on the mesopleura and another below the wings. Thorax wholly rather fine, white pilose, the shining lateral margins of the mesonotum with black pile, the bristles fine, black, not conspicuous. Scutellum convex, shining black, white pilose, without bristles.

Femora black, a reddish spot below at their base and the apex, reddish; tibiae reddish, their apices blackish; anterior tarsi reddish yellow, the remainder reddish, their segments more or less dark apically, the hind ones chiefly piceous. Legs wholly white pilose except as follows: brassy yellow beneath the hind femora; black beneath the middle and hind tibiae, and just a few black appressed hairs above on the middle tarsi. Pile wholly rather long, dense beneath the femora and tibiae; a row of long white hair on disc of hind tarsi. Bristles on front tarsi short, fine, yellow, elsewhere chiefly black.

Wings hyaline, the veins yellow on basal half; the apex of the wing in front with a grayish cloud from the apex of the first vein to the apex of R_5 (posterior section of third longitudinal vein) this cloud best seen by naked eye. Halteres yellow.

Abdomen shining blue black, the second to fifth segments each with a moderately interrupted grey pollinose apical fascia, wider laterally; pile on disc short, on sides long; white on base and on posterior margin of each segment, black across the middle, the black pile condensed sub-laterally so as to form rather conspicuous tufts on second and third segments; the last segment and genitalia above wholly pale pilose, the latter sparsely black haired below.

Female. Mystax white in middle, not dense. Pollen of mesonotum brighter, more tawny; front tarsi not wholly yellow, but similar to middle. Wings slightly clouded with brownish yellow on crossveins. Abdomen normally with the spots connected in the middle by a narrower pollinose spot, which is frequently absent in old specimens. Pile on lateral margins of abdomen wholly narrowly white; on the base of the segments, black, on the apical third, white: on the second segment only black in the middle laterally, the base bare.

♂, Walpole, Mass., May 26, 1908, (C. W. Johnson); ♀, Sharon, Mass., May 20, 1908, (C. W. Johnson).

This species has been recorded from Canada, but I have not seen specimens. The reddish antennae will distinguish it from all but *varans* and that species has chiefly black haired pleura.

(To be continued) 169

HORSEFLIES COLLECTED BY DR. J. M. ALDRICH IN ALASKA IN 1921.

BY JAMES S. HINE,
Columbus, Ohio.

Tabanus affinis Kirby.

Length 16—19 mm. This is of similar general appearance to a large group of northern species with hairy eyes and the sides of the abdomen widely reddish or yellowish. The front is moderately wide, subcallus pollinose, frontal callosity rather large, rounded, smooth shining black, and separated from a denuded elongate space above it. Palpi rather large at base, although not appearing swollen, and gradually tapering to a rather well defined point. Third segment of the antenna wide, strongly excised above with a distinct acute angle at base.

The species occurs in all the extreme northern states from the Atlantic to the Pacific and has been widely collected in Canada. The present collection contains twenty-one specimens taken at Anchorage, Nenana and Fairbanks, Alaska.

Tabanus gracilipalpis n. sp.

Length, 16 millimeters. Suggestive of *affinis*, average size somewhat smaller than that species and in general form less elongate. Female, palpi somewhat elongated, slender, only very gradually tapering and ending in a blunt point. Third segment of the antenna reddish, infuscated dorsally and apically, wide and rather short, annulate portion much shorter than the basal, distinctly excised dorsally at base, dorsal basal angle prominent and acute. Subcallus not denuded, front grayish-yellow pollinose, gradually narrowed anteriorly where it is about one half millimeter in width; ocelligerous tubercle prominent and shining, frontal callosity nearly as wide as the front leaving only a very narrow pollinose space on either side, curved inward dorsally and connected with an extension above nearly half its width and reaching very near half way to vertex; the entire structure is rather dull black in color and shows peculiar wrinkled appearance; eyes pilose. Thorax black with gray and black pile, thinly gray pollinose and with the usual stripes dorsally; wings hyaline, veins dark, costal cell pale yellowish, stigma brown; anterior leg black, tibia only slightly reddish basally; femora of other legs black, narrowly red apically, tibiae and tarsi nearly wholly reddish dorsally. Abdomen bright reddish-yellow on sides of first three segments and with a very narrow grey margin bearing a few pale yellow hairs posteriorly on each segment, first segment widely beneath the scutellum, second and third segments more narrowly, and all of following segments black; abdomen may be said to be shining reddish yellow with a nearly uniform black middorsal stripe slightly over two millimeters in width. Ventrally, first segment, anterior margin of second, a somewhat obscure midventral line on two and three and all of following segments black, otherwise venter reddish yellow.

In comparison with *affinis* the present species appears less elongate, the palpi are more slender, the front is narrower and the frontal callosity is quite different. The slender palpi easily separate it from *epistates*.

Type female from Camp 334 near Fairbanks, Alaska, July 9, 1921, and

two paratypes from Nenana, Alaska, June 27, 1921, in the U. S. National Museum. One paratype from Fairbanks, Alaska, June 30, 1921, in the author's collection.

Tabanus nudus McDunnough.

Smaller than *affinis*. Palpi pale, distinctly swollen at base and rather rapidly narrowed to a distinct point. Subcallus denuded and shining, joined above with the frontal callosity, which is separated from a linear, denuded, area above it. Front somewhat narrowed below. General color very much as in *affinis*.

One specimen from Anchorage, Alaska, June 10, 1921, one from Nenana, June 27, 1921, and one from Healey, same date.

Tabanus epistates O. S.

Palpi distinctly swollen basally and narrowed to a point, subcallus not denuded, antennae notably red, third segment only slightly excised dorsally, dorsal basal angle not very pronounced; front quite narrow and plainly narrower below, frontal callosity rather narrow, slightly higher than wide and united with a linear extension above it. This is one of the smaller species of the *affinis* group but somewhat variable in size.

One female from Nenana, Alaska, June 27, 1921.

Tabanus sexfasciatus n. sp.

Length 13 millimeters. A black species with a very narrow white fascia on the posterior margin of each abdominal segment. Wings somewhat infuscated on anterior half. Palpi slender, yellowish in general color, often slightly infuscated outwardly, narrowed to a point at apex; face and subcallus uniformly gray pollinose; antenna generally dark, almost black; third segment short, reddish at base, scarcely excised dorsally, basal angle not prominent; basal portion somewhat widened and a little longer than the apical portion. Front at vertex about two thirds millimeter in width, slightly narrowed below, densely gray pollinose, frontal callosity shining black, nearly as wide as the front, about as high as wide, curved dorsally and connected with a denuded spindle shaped marking which reaches halfway to vertex. Ocelligerous tubercle distinct, eyes pilose. Thorax black, thinly gray pollinose, the usual lines faintly discernible on the dorsum; legs black, all the tibiae reddish basally; wing hyaline, costal cell pale brown, stigma brown, veins surrounding the basal cells margined with brownish and a very slight coloring at furcation of the third vein. Both dorsum and venter of the abdomen are black with a very narrow gray border to each segment, the second dorsal segment at each side is very faintly reddish over a small area.

Type female from Camp 334, near Fairbanks, Alaska, July 9, 1921, in the United States National Museum. Two paratypes with the same data as the type; three paratypes from Camp 347 near Fairbanks, Alaska; one paratype from Nenana, Alaska, June 27, 1921, and two paratypes from Healy, Alaska, July 6, 1921, also in the United States National Museum. Two paratypes taken at Camp 347, Alaska, June 22, 1921, in the collection of the author.

There are also four paratypes in the Canadian National Collection at Ottawa under No. 594, as follows:—two females, Fort Simpson, N.W.T., (June 29, 1922) (C. H. Crickmay); one female, Fort Wrigley, N.W.T., (July 1,

1922) (C. H. Crickmay); one female, East Coast of James Bay, Que., (July 1920) (F. Johanssen).

Not to be confused with either *rhombicus* or *osburni* for both of those species have the subcallus denuded and there are other differences.

The specimens of this species are very uniform in size and coloration. There is a slight variation in the frontal callosity, however. In some specimens the spindle shaped denuded marking at the middle of the front is attached to the callosity, in some it is detached.

Tabanus septentrionalis Loew.

General form of the body narrow and somewhat elongate, abdomen dorsally with three longitudinal rows of spots, the middorsal row is composed of triangles, while on either side there is a prominent row of rounded spots extending from the first to the sixth segment, one spot to each segment. Palpi pale and distinctly swollen basally, nearly as long as the proboscis; front at vertex only very slightly more than a half millimeter in width, sides nearly parallel, frontal callosity nearly as wide as the front with an unconnected spot above, antenna dark, third segment reddish basally and with a very meager dorsal basal angle.

The present species, as it has been considered, is somewhat variable. Specimens from Western North America often have dilute yellowish wings with the body more pollinose and consequently somewhat duller. Eastern specimens quite regularly are brighter, more shining black with transparent wings. The Alaska specimens at hand agree more nearly with the latter. Intermediate and otherwise variable specimens demand attention frequently. I have found no structural characters that will separate these phases.

Twenty-five specimens were taken by Dr. Aldrich at Anchorage, Fairbanks, Nenana and Healey, Alaska, during June and July, 1921.

Tabanus metabolus McDunnough.

One specimen from Nenana, Alaska, taken June 27, 1921. The species is much like *illotus* Osten Sacken, but may be separted from that species by the denuded subcallus, the more robust form and the greater width and different form of the third antennal segment. Described in the Canadian Entomologist for October, 1922.

Haematopota americana O. S.

A single specimen of this northern species was taken at Fairbanks, July 4, 1921. This is the first record I find for Alaska. Osten Sacken had it from Fort Resolution, Hudson Bay Territory, Lake Superior, Dakota, Montana, British Columbia and other Northern localities.

Chrysops carbonarius Walker.

A specimen from Fairbanks, July 1, 1921. The first record for Alaska.

Chrysops lupus Whitney.

One specimen from Fairbanks, July 1, 1921 and two others from the same locality July 4, 1921. Reported previously from Colorado and from Laggan, Alberta.

Chrysops nigripes Zetterstedt.

Face with yellow pollinose intervals separating the facial callosities

from the cheeks, frontal callosity shining black; legs and antennae entirely black, wing hyaline and black, black as follows: costal and marginal cells, basal two thirds and apex of first basal, base and very narrow apex of second basal, first submarginal except a small area stretching between second and third veins just beyond the branching of the third vein, a very narrow area in anterior part of second submarginal, basal half of first posterior, discal, bases of second and third posterior, more than half of fourth posterior; a large part of fifth posterior and apex of anal diffuse black. Characteristic for this species among North American Chrysops is the angular extension of the cross band of the wing along the third vein to where this vein branches. Abdomen black dorsally, each segment with a narrow gray border which expands into a triangle at the middle, first and second segments narrowly bright yellow at the extreme sides.

Four specimens; one, Fairbanks, June 30, 1921, two, Nenana, July 5, 1921 and one, Anchorage, July 21, 1921.

Previously reported from northern Europe by Zetterstedt, from Sitka, Alaska, by Loew and from Kukak Bay, Alaska by Coquillett. Two specimens were taken at Lakeview, Montana, August 4, 1920, by A. N. Caudell.

A NEW RACE OF BRENTHIS FROM COLORADO (LEPID.)

BY WM. BARNES AND F. H. BENJAMIN,

Decatur, Ill.

Brenthis frigga Thunberg

1791, Thun., Diss. Ent. Suec., II, 23, *Papilio*.

Typical *frigga* presumably does not occur in North America. The broad band of pale spots on the underside of the secondaries immediately separates *frigga* from *saga* and allied North American forms, which probably represent a distinct species. However, as the authors possess only seven specimens of typical *frigga*, they prefer to describe the following new subspecies as a geographical race of *frigga*. Should the North American forms ultimately prove to represent a distinct species, the name *frigga* can be dropped and *saga* substituted.

Brenthis frigga race **sagata** nov.

Upper side; primaries; similar to poorly marked specimens of *frigga* from Europe, the lines and markings clean-cut; secondaries; with the blackish suffusion of the basal area restricted to the basal half of the cell and anal area; thus differing from *saga* in which the black suffusion of the secondaries occupies nearly all of the basal area to the median band. Underside: similar to *saga*, the maculation usually somewhat more intensified and less suffused.

The habitus of *sagata* so closely resembles *epithore* that the Colorado record of *epithore* in Holland, Butterfly Book, probably represents *sagata*. Holland's figure of *frigga* appears referable to *saga*.

A series of specimens from Alberta can remain as intermediates between *saga* and *sagata*.

Type localities and number and sexes of types: Holotype, ♂, June 24, 1893; allotype, ♀, June 23, 1893; 8 ♂, 5 ♀ paratypes, June 23—24, 1893; all Hall Valley, Colorado, Wm. Barnes: 4 ♂ paratypes, "Colo." (Bruce); 1 ♀ paratype "Colorado".

NOTES ON THE IDENTITY OF SPHINX VANCOUVERENSIS EDW. (LEPID.)*

BY J. MCDUNNOUGH,

Ottawa, Ont.

For some time there has been considerable doubt in my mind as to the correctness of the generally accepted conception of this species, based on the Monograph of the Sphingidae by Rothschild and Jordan. In this monograph the authors (p. 130) are inclined to ascribe seasonal dimorphism to the species, applying the name *"vancouverensis"* to a form with pale thorax, figured on Pl. XIII, fig. 3, and using *albescens* Tepper for the form with blackish thorax (Pl. XIII, fig. 4). In justice to the authors it should be noted that they had no material from Vancouver Island, B. C., before them; had this been the case they would scarcely have fallen into the above error, as all the specimens I have ever examined from British Columbia, (irrespective of date of capture) belong to the form with dark thorax (R. & J.'s fig. 4).

The original description of *Sphinx vancouverensis* (1873, Proc. Calif. Acad. Sci. V, 111) was based on a single specimen taken by Dr. Bremner at Esquimault, Vancouver Island. Correspondence with Mr. F. E. Watson of the American Museum of Natural History elicited the startling fact that the specimen marked "type" in the Hy. Edwards' Collection was from Big Trees, Calif. This "type" is of course, spurious, and has been the cause of errors of identification to be mentioned shortly. Mr. Watson fortunately was able to discover the true type amongst the other material in the collection and has labelled it accordingly, after a careful comparison with the original description. It now bears the following labels:—

Vancouver Island; 2404 (Hy. Edwards' original number); 7226, Coll. Hy. Edwards, (A.M.N.H. label, old catalogue); 24175, (A.M.N.H. new catalogue); red label, type. Mr. Watson writes, "This is the true type of *Sphinx vancouverensis*, the original type label being placed on No. 7227 in error. This specimen is a female (not male as stated) but it agrees exactly with the original description and with the sizes there stated. The two so-called types (*vide* Beutenmuller, Bull. Am. Mus. Nat. Hist., IV, 170) are much smaller. I would call to your attention the submarginal band mentioned in the original description, 'the outer edge of which is deeply dentate.' This exactly describes that band in No. 7226."

An excellent photograph of this type has been furnished me by Mr. Watson, which proves the species to be, not the one figured by Rothschild and Jordan on Pl. XIII, fig. 4, but the one recorded by Taylor and Gibson (Can. Ent. 1909, p. 423), as *perelegans* Edw. I might note that the type is a very worn specimen, but the size and the presence of a distinct black streak in the cell render identification easy. The dentate nature of the outer margin of the pale subterminal band is accentuated by the fact that the veins are denuded of dark scaling. Whether *vancouverensis* will fall as a direct synonym of *perelegans* or whether the name may be used for a racial form is a matter I cannot settle, as California specimens are lacking in the Canadian National Collection; for the present I see no harm in using the name in a racial sense.

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*—Contribution from the Division of Systematic Entomology, Entomological Branch, Dept., of Agric., Ottawa.

The above reference leaves our smaller species from Vancouver Island and adjacent territory (R. & J.'s fig. 4) without a name. For the pale form, the *Symphoricarpus* feeder, common in the Prairie Provinces (R. & J.'s fig. 3), the name *vashti* Stkr. seems applicable. Strecker's figure (Lep. Het. Pl. XV, fig 4) gives a very adequate representation of the species; *albescens* Tepper, judging by the description, is simply a form of *vashti* with darker colored thorax; such specimens often occur and vary in the degree of intensity. After a careful comparison of our Vancouver Island and prairie forms I am inclined to ascribe to the former specific rank and describe the species as follows:

Sphinx mordecai sp. nov.

Front whitish gray, this color extending backward over the lower portion of the patagia above the base of the wings; palpi, thorax and dorsal portion of patagia deep black brown, with a slight sprinkling of white scales towards the posterior portion of thorax. Abdomen black, with lateral whitish segmental half-bands; dorsum of abdomen gray-shaded with a centro-dorsal dark line. Prinmaries black-brown shaded with white at the base of the wing and along costal portion of wing to near end of cell; black streaks in the interspaces between veins 2 & 3, 3 & 4, 5 & 6 and a slightly bent black streak from apex of wing to middle of vein 6; a black line, subparallel to outer margin, subterminally between veins 2 and 6, being considerably further removed from outer margin at 2 than at 6; a white, almost even line parallel to outer margin and close to same from below apex to anal angle, the space between this line and the aforementioned black line being partially filled with white scaling; the apical dark dash is also shaded on its costal side by white. Secondaries blackish; base of wings and a curved median band whitish; outer margin with a narrow band of paler color. Length of fore wing 35 mm.; of body 30-35 mm.

Holotype— ♂, Penticton, B. C., (May 24, 1921, W. B. Anderson); No. 596, in the Canadian National Collection, Ottawa.

Allotype— ♀, Wellington, B. C., (May 30, 1903, G. W. Taylor); in the Canadian National Collection, Ottawa.

Paratypes—4 ♂, 1 ♀, Wellington, B. C., (G. W. Taylor); 2 ♂, Vancouver (Livingston); 1 ♂, Vernon, B. C., (E. P. Venables); 1 ♀, Peachland, B. C., (July 8, 1907, J. B. Wallis); in the Canadian National Collection, Ottawa.

The species is well figured by Rothschild and Jordan (Pl. XIII, fig. 4). Apart from the darker color of thorax and wings it may be distinguished from *vashti* Stkr. by the lack of a second, more indistinct line, bordering the black sub-terminal line on its inner side and attaining inner margin after a slight outward bend and angle.

GRYLLOBLATTA IN CALIFORNIA

BY A. N. CAUDELL,
Washington, D. C.

Grylloblatta is an interesting genus of insects described from Banff, Alberta, some years ago by Dr. E. M. Walker[1] as a new family of Orthoptera. Later it was elevated to ordinal rank by Dr. G. C. Crampton[2] under the name

(1). Can. Ent., vol. XLVI, p. 93-99, pl. VI (1914).
(2). Ent. News, vol. XXVI, p. 346 (1915).

Notoptera. It was established on two specimens, both females, taken on Sulphur Mountain, near Banff, on June 29th, 1913. Later seven more specimens, including both sexes, were studied and described by Walker.[3] All this material is from the type locality and thus the finding of the genus in California, almost a thousand miles across the mountains to the southwest, is a matter certainly worthy of record. Credit for the discovery of this genus in California is due to Mr. H. S. Barber of the National Museum.

While examining a colony of hibernating coccinellid beetles, Mr. Barber had occasion to turn over a piece of board projecting from beneath some debris, and under it he saw a single specimen of an elongate, cricket-like insect, which was instantly recognized as *Grylloblatta* and secured. Gathering dusk, continuation of the storm which had added a foot or more of fresh snow to the old snow covering the ground, and inability to revisit the locality prevented the finding of more material. The coccinellid congregation was found by direction from a miner to a pile of cedar branches showing above the snow. This was on January 23rd of the present year and the locality is in Plumas County, California, on the North Fork of the Feather River, near a deserted cabin by the river, about two and one half miles above the Caribou Power House.

A somewhat careful study of the above specimen shows without doubt its generic position, and the species represented is questionably determined as *campodeiformis* Walker, the type of the genus and the only species so far known.

The structure of the tip of the abdomen of this Californian individual indicates that it is an immature male. The total length of the insect from front of head to tip of abdomen is 20 mm., a rather large size for *campodeiformis*, judging from measurements given by Walker for the male of his species. Walker's measurements were, however, made from dried material, while the present specimen is preserved in spirits. The size of the female of *campodeiformis*, 30 mm., would indicate that the male might well be as large, or even decidedly larger, than this Californian specimen, and thus the size does not militate against this nymph taken by Barber being *campodeiformis*. Structurally, very little was found at variance with the description of *G. campodeiformis*, the only characters noted as not agreeing with those of that species being as follows: The general appearance does not seem to agree very well with *campodeiformis* as figured by Walker, the shape being less campodeiform and more cricket-like. The antennæ are longer than described for *campodeiformis*, measuring 15 mm. in length, and there are forty segments, one of the antennae, however, being broken off at the 30th segment. The terminal segment of the complete antennæ is decidedly more pointed apically than the others. The greatest number of antennal segments noted for Canadian specimens of *campodeiformis* is twenty-nine. If this plurality of antennal segments is indicative of specific distinctness for the Californian specimen or not is a matter of doubt, as *campodeiformis* may indeed possess as many as forty antennal segments, all Canadian specimens of that species examined being in that case imperfect. The detailed figure of the antennae of *campodeiformis* given by Dr. Crampton[4] would indicate, however, that he had drawn from a complete antenna the terminal segment showing a

(3). Can. Ent., vol. LI, p. 131-139, pl. VIII-IX (1919).
(4). Can. Ent., vol. XLIX, p. 214, fig, (1917).

distinctly more pointed tip than the preceding ones. Dr. Crampton states, however, in the article accompanying this figure, that the drawing is not to be taken as an absolutely accurate portrayal, and thus this particular detail may not be exact. Another apparent point of difference is that the right coxite bears no dorsal appendage at the base as shown by Walker's figure[5], but this is probably due to the immature state of the specimen, as it is said to be much reduced in the nymphs of Walker's specimens. The pronotal disk of *campodeiformis* is figured and described as posteriorly truncate and with the preapical transverse sulcus of that plate straight, while this Californian specimen has the plate distinctly obtuseangulate behind and the transverse sulcus decidedly sinuate. But these apparent differences may be due to shrinkage of Walker's material. Another, and more striking difference is that the posterior femora of the 20 mm. long specimen from California measures 5 mm. in length while those of the 30 mm. long type of *campodeiformis* are stated to be but 3.4 mm.

In spite of the longer posterior femora, the forty segmented antennae and the other less important points of difference noted above, it is thought best to refer this Californian specimen to *campodeiformis*, though with considerable doubt. Its true status can be definitely determined only by direct comparison with specimens of the true *campodeiformis*, or by the accession of additional Californian material.

NOTES ON SOME DIPTERA

BY C. HOWARD CURRAN,
Ottawa, Ont.

Eucyrtopogon varipennis Coq. differs from all other species in the genus in having the third vein branched beyond the discal crossvein, and thus agrees in this character with *Cyrtopogon*. Notwithstanding this fact, I consider that it belongs in the first mentioned genus because of the structure of the antennae and general form. The enumeration of characters for *Eucyrtopogon* (antea, p. 95) should be amended by the insertion, at the conclusion of the sentence, line 12, page 95, of the following: "except in *E. varipennis* Coq."

Apicomyia Shannon. This Syrphid genus was proposed in "Insecutor Inscitiae Menstruus," Vol. X, p. 122, August, 1922. It is the same as *Cynorhinella* Curran, established in "Canadian Entomologist" LIV, p. 14, 1922. Shannon overlooked my genus.

Syrphus protritus O. S. An examination of the type of this species and comparison with specimens of *S. nitidicollis* Mg. from Europe shows that *protritus* is a synonym of *nitidicollis*.

Odontomyia alberta Curr. is the same as *O. varipes* Loew.

(5). Can. Ent., vol. LI, p. 132, plate VIII, fig. 1, exp (1919).

Mailed June 25th, 1923

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